Distribution.—These two subspecies seem to be distributed, roughly speaking, in the manner stated by De Selys-Longchamps in 1847, in fact it would be impossible to add to or correct what he has said on this point without examining more specimens than are at present available. The fact that the two French specimens which I have been able to examine are of the *neglectus* form is very interesting and confirms De Selys-Longchamps's statements. There are no German specimens in the British Museum collection, but Dehne[1] has stated that *M. agrestis neglectus* occurs fairly commonly in Saxony, near Penig and Lössnitz, while Fatio found it in the Hasli Thal, in Switzerland.

To show the differences in size between the two races, I give the dimensions (see pp. 600, 601).

The measurements are taken from the ten largest British specimens I could lay hands upon, and I have added to them those of the only two French specimens which were available.

In all cases, except those of Mr. Bonhote's specimens, the measurements of the tails were taken so as not to include the last hairs. The specimens kindly collected for me by Messrs. Coward and Caton Haigh were measured by Mr. F. Metcalfe of Cambridge; the dimensions of the remainder were taken by the collectors. It will be seen that the length of an average British specimen runs to about 106 millimetres, while anything above that must be regarded as large. The two largest British specimens I have been able to examine are my own no. 47, sent me by Mr. Coward from Cheshire, and Mr. de Winton's no. W. 86 from Herefordshire. These two somewhat approach the younger Norway specimens in size and characters, and these are the only two that do so out of numerous specimens examined.

3. Contributions to the Anatomy of Picarian Birds.—Part III. On some Points in the Anatomy of the Kingfishers. By Frank E. Beddard, M.A., F.R.S., Prosector to the Society.

[Received May 18, 1896.]

The family Alcedinidæ shows more structural variation within its own limits than any other family of Picarian Birds.

The first to call attention to this was Prof. Garrod, who remarked in describing[2] the tensores patagii of various Passerine and Picarian Birds—"In the Alcedinidæ the differences are so considerable in the several genera that I reserve the description of the muscle in this order for a future occasion." Again, in referring to the course of the leg-veins he pointed out the abnormal con-

[1] A. Dehne in 'Allgemeine deutsche naturhistorische Zeitung,' new series, vol. ii. pp. 212 and 223 (1856).

[2] "On some Anatomical Peculiarities which bear upon the Major Divisions of the Passerine Birds.—Pt. I.," P. Z. S. 1877, p. 512.

ditions obtaining in *Dacelo*[1]. Prof. Garrod never carried out the intention expressed in the above quotation. I propose in the present paper to supply this deficiency and to bring before the Society other facts in the anatomy of the group.

Pterylosis.

The Kingfishers have for the most part a tufted oil-gland. But I find that in *Cittura cyanotis* and *C. sanghirensis* the oil-gland is distinctly nude, and I have a note by Mr. Forbes to the effect that that is also the case with three species of *Tanysiptera*. In the latter genus, moreover, there are only *ten* rectrices; in other Kingfishers (including *Cittura*) *twelve*.

According to Dr. Gadow's table[2], the Alcedinidæ and Cypselidæ are the only families of Picarian birds in which the 5th cubital remex may be either absent or present.

Dacelo, *Ceryle*, and *Sauropatis* are aquintocubital; *Cittura*, *Alcedo*, and *Halcyon* are quintocubital.

The feather-tracts of a few species have been examined by Nitzsch. I have studied those of a few others. In the majority of Kingfishers the ventral tract branches in the pectoral region on each side into a stronger outer and a weaker inner branch, the latter being continuous as far as the cloaca. Nitzsch remarks of "*A. collaris*" (=*Sauropatis chloris*) that it is "strikingly distinguished by having the outer branch of the inferior tract very near the main stem." I find that a broad pectoral tract, barely, if at all, distinguishable into two branches, characterizes the following species of *Sauropatis*, viz.: *S. sordidus*, *S. vagans*, and *S. chloris*; it is very possibly a mark of the genus.

In this genus, as in *Dacelo* (figured by Nitzsch), in *Halcyon* and in *Cittura* there is a very long gap sparsely feathered which lies between the anterior and posterior closely feathered parts of the spinal tract. In *Alcedo ispida*, on the other hand, the trunk part of the spinal tract is closely feathered throughout. I find in *Ceryle americana* an intermediate condition, the dorsal gap being but slightly marked.

It will be observed that these various divergences in the arrangement of the pterylæ correspond in every case to a missing 5th remex.

Tendons of the Wing.

The tendons of the tensor patagii brevis show three modifications among the Kingfishers, which are shown in the accompanying drawings (figs. 1–3) by the late Mr. W. A. Forbes.

In *Alcedo ispida*, Fürbringer (Unters. z. Morph. u. Syst. Vögel, Taf. xxiii. fig. 17), we have the simplest conditions. The tendon in question is perfectly simple, without branch or complication of any kind. *Alcyone lessoni* is precisely the same.

[1] *Ibid.* p. 516.

[2] "Aves" in Bronn's 'Thier-Reich,' Syst. Theil, p. 82.

In *Halcyon rufa* (fig. 1), *H.* sp., *Ceryle alcyon* (fig. 2), and *C. americana* there is only a single tendon, but it gives off a forwardly running wristward slip. The main tendon, as in *Alcedo*, is continued over the muscles of the forearm to the ulnar side. In *Ceryle* (fig. 2) there is this difference, that the main tendon is very wide and diffused. *Sauropatis sordidus* (somewhat unexpectedly) agrees with *Halcyon* in its single tendons.

Fig. 1. Fig. 2. Fig. 3.

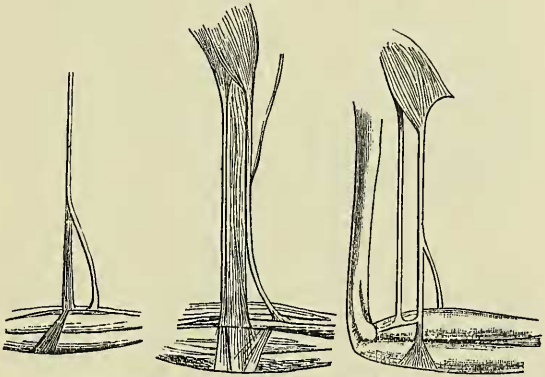

Fig 1.—*Halcyon rufa.* Tendons of tensor patagii brevis.
Fig. 2.—*Ceryle alcyon.* Tendons of tensor patagii brevis.
Fig. 3.—*Sauropatis albicilla.* Tendons of tensor patagii brevis.

In *Dacelo*, *Sauromarptis*, *Pelargopsis*, *Sauropatis* (fig. 3) (*sanctus*, *albicilla*, *vagans*, *chloris*), *Cittura* (*sanghirensis*, *cyanotis*), and *Tanysiptera* the tendons are more complicated. There are two separate tensor patagii brevis tendons which often converge, and very nearly if not quite meet at their insertion onto the forearm; the anterior of these, which is alone continued onto the ulnar side of the arm, has a wristward slip.

Syma agrees with these genera in having two parallel tendons, but differs from them in having no wristward slip.

To another myological peculiarity of some Kingfishers attention was first called by Dr. R. O. Cunningham. He pointed out the existence in *Ceryle stellata* of a tendinous link uniting the two *biventres cervicis* muscles, and the absence of this link in *Alcedo*. I have examined the genera mentioned in the table at the end of this paper (p. 606), with the exception of *Syma* and *Tanysiptera* (upon which I have a note by Prof. Garrod), and find that there are quite as many genera which have this tendinous link as there

are which have it not. The *expansor secundariorum* is another muscle which is sometimes absent and sometimes present.

In marked contrast to the muscular anatomy (excepting the leg-muscles, of which the formula seems to be always AX—), and to the external characters, is the syrinx. I have examined this organ in *Alcedo*, *Dacelo*, *Cittura*, *Ceryle*, *Halcyon*, and *Sauropatis*, and find it to be most uniform in structure. In all it is of the typical tracheo-bronchial form, without a complete coalescence of the last rings of the trachea, except sometimes in front. The intrinsic muscles (a single pair) are well developed and fan out considerably at their insertion onto the first, or apparently sometimes the first and second bronchial semirings. In *Dacelo cervina* it is quite plain that there are two pairs of intrinsic muscles. The most anterior of these is the more slender; the wider muscle arises from the trachea just where the extrinsic muscles are given off; it covers over the insertion of the first muscle and is pyramidal in form, the first muscle being an elongated strip arising in common with the extrinsic muscle.

The Kingfishers being a group which shows so much diversity in structure, the following tabular statement may be of use:—

	Exp. sec.	5th Remex.	Tensor pat. brev.	Biventer link.	Oil-gland.
Dacelo	+	—	2 tendons + ant. slip.	—	tufted.
Tanysiptera	+	...	„ „	+	nude.
Syma	+	...	2 tendons; no ant. slip.	—	
Cittura	+	+	2 tendons + ant. slip.	+	nude.
Alcedo	0	+	1 tendon.	—	tufted.
Pelargopsis	+	...	2 tendons + ant. slip.		
Todirhamphus	+	...	„ „		
Alcyone	...	...	1 tendon.		
Ceryle	+	—	1 tendon + ant. slip.	+	tufted.
Halcyon	+	+	„ „	—	tufted.
Sauropatis	—	—	2 tendons + ant. slip.	—[1]	tufted.
Sauromarptis	...	...	„ „		

[1] + in one of two specimens of *S. vagans*.

The above table not only displays the variation in structure of the family but shows the impossibility of a subdivision of the family, at least without further facts—for it is unnecessary to point out specially the lacunæ in the above table.

Halcyon is perhaps to be regarded as the simplest form, while *Dacelo* and *Sauropatis* are at the opposite extreme. The necessary separation of *Sauropatis* and *Halcyon* is the classificatory fact upon which I would lay the greatest stress. It may be that the black-billed species will turn out to be *Sauropatis*, and the red-billed the true *Halcyon*.

I would also point out the somewhat disappointing fact that no particular results seem to be obtainable from a comparison of the quintocubital with the aquintocubital genera.